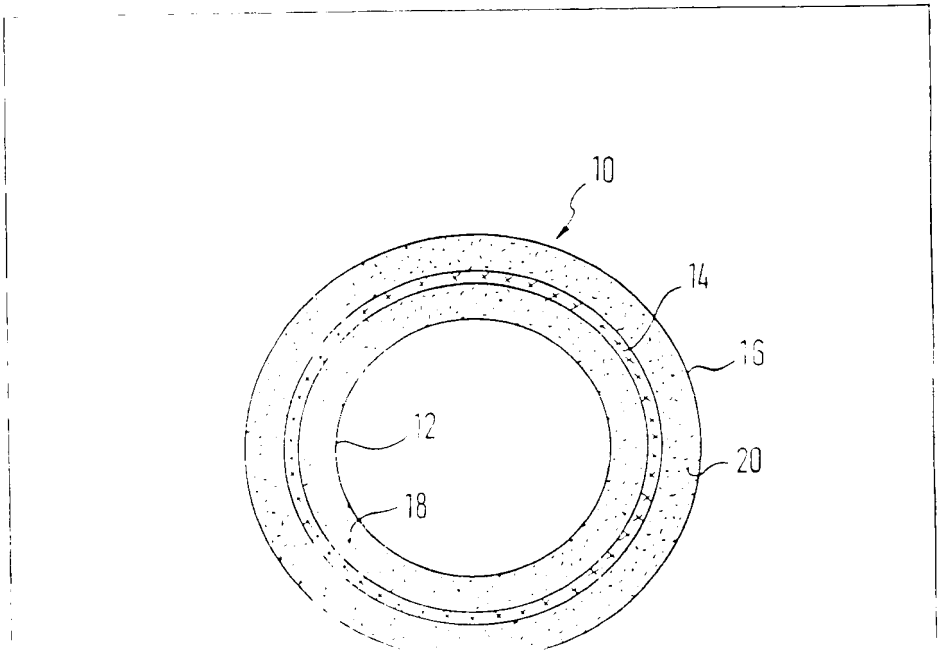
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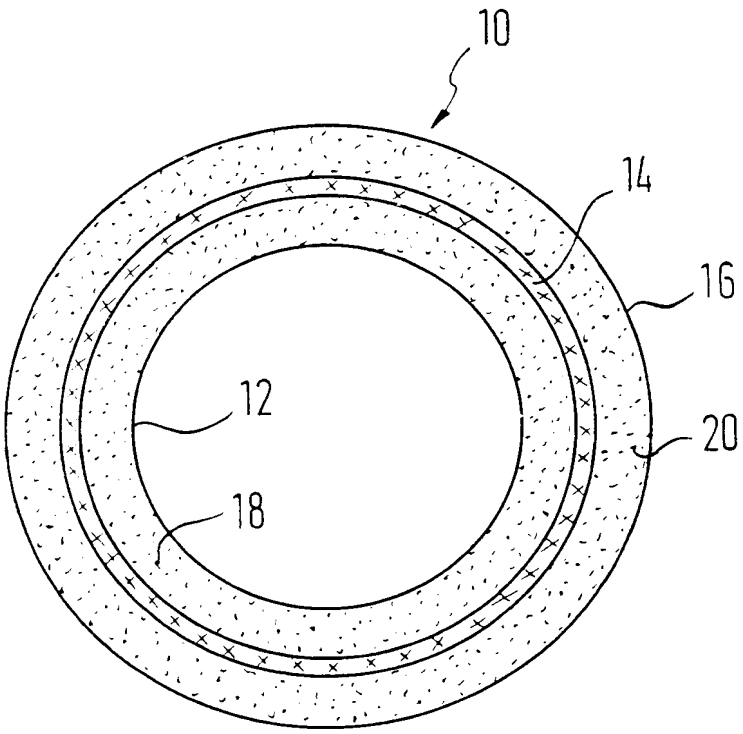
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(54) **Reinforced hoses**

(57) A flexible tube (10) has a reinforcing fabric insert (14) arranged between an internal tube member (12) and an external tube member (16). The material for the tube members is reinforced by admixed orientated staple fibres (18, 20), from 10 to 30 parts by weight of staple fibres being used per 100 parts by weight of tube member material. The material of the tube may be vulcanisable rubber and the staple fibres may comprise unregenerated cellulose. The tube may be made by extruding an inner member (12), applying a fabric layer (14) then either spraying or extruding the outer layer (16).



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SPECIFICATION

Flexible tube

The invention relates to a flexible tube with an insert arranged between internal and external tube members, and to a method of producing such a flexible tube.

In a flexible tube of this type, the insert provided between the internal and external tube members acts as a reinforcement, and the functionality of the flexible tube is jeopardised if the insert and slight defects and deficiencies, which cannot be completely avoided in mass production. These production faults are generally only noticed when the tube is being used, and which stage there is no way in which they can be eliminated, and the only way of dealing with the matter is to replace the tube by a tube which is free from defects.

In particular, owing to the increasingly stringent specification requirements being demanded in the motor vehicle industry, additional requirements are imposed on the processing and making up of the raw material for these tubes prior to vulcanisation, and these are found to be disadvantageous in the testing of the article.

The object of the invention is therefore to provide a flexible tube and a method of producing it in which the above-mentioned disadvantages do not occur. In particular, a flexible tube is to be produced in which the required strength is ensured even if there is a fault in the reinforcing insert.

According to the invention there is provided a flexible tube comprising an insert arranged between an internal tube member and an external tube member, wherein the material for the external tube member and/or the material for the internal tube member is reinforced by admixed staple fibres.

In a preferred embodiment, both materials contain admixed staple fibres.

A particular advantage of the invention is that the internal tube member and the external tube member have an inherent strength which is indepedent of the insert and is sufficiently great for the flexible tube to remain completely functional, i.e. its bursting pressure remains above the prescribed value even if there are small defects in the insert. This can be achieved merely by mixing staple fibres with the starting materials for the internal and external tube members which are generally made of rubber, so that the known procedure for producing flexible tubes of this type only has to be modified slightly. Also, the conventional elastic materials which are available in [illegible] can be used for the internal and [illegible] tube perpendicularly to its longitudinal direction.

In a preferred embodiment of the method of the present invention, a mixture of a vulcanisable rubber [illegible] unregenerated cellulose of tubular structure is produced, using from 10 to 30 parts by weight of staple fibres per 100 parts by weight of rubber material. This starting material is shaped in the desired manner and vulcanised.

For this purpose, the material for the internal tube member is extruded in the desired manner. An insert is made up on the extruded internal tube member and consists of a woven, knitted or hosiery fabric. An external tube member is then for over the insert by spraying or extruding the material for the external tube member generally rubber, which has also been mixed with staple fibres.

The starting material can be shaped in a conventional manner on a screw press extruder. Fibre orientations which differ depending on the desired properties can be achieved in the semi-finished material by varying the design of the extruding tools.

If necessary, it is possible to mix only one of the two materials, i.e. either that for the internal tube or that for the external tube, with the staple fibres.

The invention is described in more detail below with the aid of an embodiment illustrated in the accompanying drawing which shows a cross-section through a flexible tube according to the present invention.

A flexible tube 10 comprises an internal tube member 12, and insert 14 surrounding the internal tube member 12 and an external tube member 16. A woven, knitted or hosiery fabric can be used as insert 14.

The materials for the internal and external tube members 12 and 16, generally rubber, are mixed, before being processed to form the tube, with staple fibres which consist of a unregenerated cellulose of tubular structure and are indicated in the drawing by the reference numerals 18 and 20. The material contains from 10 to 30 parts by weight of staple fibres per 100 parts by weight rubber material ay any time.

The staple fibres 18 and 20 are supplied to the starting material in such a way that they are orientated longitudinally to the flexible tube 10 during the processing of the internal tube member 12 and external tube member 16 described below.

The flexible tube 10 is then produced as follows. The rubber containing a vulcanisation agent for the internal tube member 12 is mixed with staple fibres 18. This material is, then extruded in the shape of the desired internal tube member 12, i.e. in the form of a tube having a predetermined internal diameter and the wall thickness of the internal tube member 12.

The extruded internal tube member 12 is assembled with the insert 14, i.e. the insert 14 is placed round the external surface of the internal tube [illegible] member can be extruded on to this assembly.

If necessary, the material for the external tube member 16 can previously be mixed with orientated staple fibres 20. It is also possible to mix only the [illegible] with staple fibres.

This semi-finished tube is then vulcanised in the

conventional manner, vulcanisation being carried out at a temperature of from 120° to 200°C.

In to a preferred embodiment, the shaping of the starting material and the vulcanisation are carried simultaneously.

CLAIMS

1. A flexible tube comprising an insert arranged between an internal tube member and an external tube member, wherein the material for the external tube member and/or the material for the internal tube member is reinforced by admixed staple fibres.

2. A flexible tube according to claim 1, wherein the staple fibres are orientated.

3. A flexible tube according to claim 2, wherein the staple fibres are orientated differently in the external tube member and the internal tube member.

4. A flexible tube according to any one of claims 1 to 3, wherein the staple fibres consist of unregenerated cellulose having a tubular structure.

5. A flexible tube according to any one of claims 1 to 4, wherein from 10 to 30 parts by weight of staple fibres are used per 100 parts by weight of tube member material.

6. A flexible tube according to any one of claims 1 to 5, wherein the insert is a woven, knitted or hosiery fabric.

7. A flexible tube substantially as herein described with reference to the accompanying drawing.

8. A method of producing a flexible tube with an insert arranged between internal and external tube members, wherein the material for the internal tube member and/or the material of the external tube member is mixed with staple fibres, the material for the internal tube member is extruded, the insert is assembled onto the extruded internal tube member and the material for the external tube member is applied to the insert.

9. A method according to claim 8, wherein the material for the external tube member is sprayed on to the insert.

10. A method according to claim 8 wherein the material for the external tube member is extruded on to the insert.

11. A method according to one of claims 8 to 10, wherein vulcanisation is carried out at a temperature of from 120°C to 200°C.

12. A method according to claim 11 wherein vulcanisation and deformation are carried out simultaneously.

13. A method according to 11 or 12 wherein sulphur or an organic peroxide is used as a vulcanisation agent.

14. A method of producing a flexible tube, substantially as herein described with reference to the accompanying drawing.

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